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AMERICAN SOCIETY
OF CIVIL ENGINEERS

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CITY PLANNING DIVISION

Proceedings of the American Society of Civil Engineers

CITY PLANNING EDUCATION FOR THE CIVIL ENGINEER

Progress Report of the Committee on Education
of the City Planning Division
(Proc. Paper 1877)

SYNOPSIS

The role of the city planner is essential in this era of expanding urbanization in which the problems of city planning and the need for trained city planners is receiving increased attention. Good opportunities for employment exist for those with training in principles and practice of city planning.

The joint ASPO-AIP-Bettman Foundation Report by Professor Frederick J. Adams on "Urban Planning Education in the United States", is reviewed from the viewpoint of the civil engineer.

Attention is focused on the role of the civil engineer as a city planner. Many civil engineers have had careers as city planners and have made important contributions in the development of principles and their fulfillment in the practice of city planning. In order to maintain a competitive position with other groups and to improve the proficiency of civil engineers in city planning, civil engineering students in college should have the opportunity of receiving instruction in the principles and practice of city planning. Suggested programs of instruction in city planning for civil engineering students are described. The need for courses in city planning for civil engineering students should be recognized by the American Society of Civil Engineers and the Engineers' Council for Professional Development.

PREFACE

American cities are growing fast. The problems of constructing streets and sewers, of providing public services, of handling traffic, of controlling subdivisions, of regulating zoning, and of building housing have become so involved that city planning is today an important function of city government.

New procedures are being developed in city planning to meet the challenges of increased urbanization. New positions in city planning are being created in

Note: Discussion open until May 1, 1959. To extend the closing date one month, a written request must be filed with the Executive Secretary, ASCE. Paper 1877 is part of the copyrighted Journal of the City Planning Division, Proceedings of the American Society of Civil Engineers, Vol. 84, No. CP 2, December, 1958.

many cities. Various professional groups are being called upon to engage in the work of city planning. There is also a growing group of men with particular training in the principles and practice of city planning.

For certain aspects of the field of city planning, the civil engineer is by training and experience the most familiar. These aspects include public works, public utilities, streets and expressways, transportation and traffic control, water supply and sewerage, and layout of subdivisions.

The city plan itself is a design for the physical development of the municipality. Even though in the development of such a plan it is necessary to consider social and economic needs as well as financial and legal problems, the provision for future physical facilities and their proper coordination comprises the major part of the planning. For this reason, city planning is a logical task of the civil engineer.

This is a report on education in planning for the civil engineer.

Summary of Recommendations

1. The American Society of Civil Engineers, as a society member of the Engineers' Council for Professional Development, should strongly urge:
 - A. That some instruction in city planning be offered to civil engineering students in accredited curricula in civil engineering, and
 - B. That accredited curricula in civil engineering continue to provide for training in the layout, design, and construction of public works and similar municipal projects in order that the civil engineer may obtain the basic training to qualify him to function as a "specialist" in city planning activity.
2. The American Society of Civil Engineers should endorse the following recommendations in the joint ASPO-AIP-Bettman Foundation Report (Adams Report):
 - A. "Efforts should be made to increase the number of options or majors in planning offered by departments of—civil engineering—, not only to provide a better basis for further academic work in planning at the graduate level but to help in meeting the need for planning specialists in the larger offices," (Section 6, fourth paragraph, page IX).
 - B. "Evening courses— should be provided by planning schools—to provide for persons working in private offices or public agencies who are not in a position to enroll as full-time students in the universities." (Section 6, second paragraph, page VIII).
 - C. "Encouragement should be given to the establishment of short courses or institutes, on a regional basis, to bring together practitioners in various fields for a discussion of planning problems of mutual concern and to enable practicing planners to keep up with developments in planning techniques and procedures." (Section 6, third paragraph, page IX).
3. The American Society of Civil Engineers should endorse the conclusions of this report on "City Planning Education for the Civil Engineer" as follows:

Conclusions

- A. The importance of the field of city planning should be clearly presented to civil engineering students.
- B. Courses in city planning should be available to students in civil

engineering in all colleges of engineering. Such courses should be carefully designed to provide instruction in modern concepts and practices of city planning. They should be taught only by instructors with training and experience in city planning.

C. The division of city planning in departments of civil engineering in colleges of engineering should be placed on an equal standing with the divisions of structural, hydraulic, sanitary, highway, transportation, and construction engineering, soil mechanics and foundations, and surveying.

D. In universities, the department of civil engineering should be included with other schools and departments in the organization and expansion of city planning programs.

E. Encouragement should be given to civil engineering students who are interested in practicing city planning to enroll in curricula leading to degrees in city or regional planning either on a graduate or undergraduate basis.

I. The Purpose of the Report

A. The purpose of this report is: "To review the joint ASPO-AIP-Bettmen Foundation report on education for planners; to consider that report in the light of the role that engineering schools might play in training engineers for the planning profession or in acquainting them with it; to make recommendations to the Society Committee on Engineering Education." (Official Register, American Society of Civil Engineers: Statement of purpose for Committee on Education, City Planning Division.)

B. Another purpose of this report is to call the attention of the Engineers' Council for Professional Development to the importance of city planning. The American Society of Civil Engineers is a member Society of the Engineers' Council for Professional Development and should make recommendations to the ECPD in regard to engineering curricula.

C. A further purpose of this report is to promote interest in the field of city planning on the part of engineers and various engineering societies.

D. All these purposes are in harmony with the purpose of the City Planning Division which is: "to promote a wider understanding of the science and art of planning towns, cities, and communities through (a) preparation of papers dealing with numerous phases of planning, (b) discussion of planning principles and activities at society meetings, and (c) publication of manuals on planning subjects and techniques of special significance to engineers. Since planning comprehends the full development of a community, the engineer as a planner is concerned with the coordination of the work of the engineer, the architect, the landscape architect, the lawyer, the economist and the sociologist, insofar as they affect arrangement, design, and improvement of a community." (Official Register, American Society of Civil Engineers.)

II. The Objectives and Scope of City Planning

A. Definition. City planning constitutes the application of intelligent foresight to the development of communities. A more detailed definition of City Planning stated by Mr. Nelson P. Lewis, the first chairman of the City Planning Division of ASCE, is:

"City Planning is simply the exercise of such foresight as will promote the orderly and sightly development of a city and its environs along rational

lines with due regard for health, amenity, and convenience and for its commercial and industrial advancement."

B. Objectives. The objectives of city planning are the development of efficient and satisfying environments in which the inhabitants of the city may work, play, and live.

C. Role of the City Planner. The work of a city planner is primarily to improve the physical arrangement and development of the city so that the community may adequately serve its best economic and social purpose.

D. The Field of City Planning. There has been an enlargement in recent years of the sphere of city planning in many jurisdictions beyond the physical planning of public works and buildings, transportation systems, and recreational facilities so as to include coordinated and comprehensive planning for land use and major physical services. Under this enlarged concept, personnel in city planning departments serve as staff aids to administrators and policy-makers in government in gathering pertinent information, in sifting and winnowing, in preparing analyses of problems, and in suggesting to policy-makers in government alternate lines of action and their probable results. From a broad viewpoint, city planning may be considered to be the activity by means of which organizations determine how resources should be conserved and utilized and what methods should be used in the development of cities to achieve designated goals effectively. According to this concept, the field of city planning involves an organized endeavor to mold the physical environment consistent with economic and social needs.

E. Points of View about City Planning. There are different points of view as to what constitutes the field of city planning. These different points of view are described by Mr. Harland Bartholomew, Member, American Society of Civil Engineers, as follows:*

"There are several points of view about city planning. The civil engineer sees mainly the water supply system, sewers, utilities, streets, transportation facilities and terminals. The sociologist is concerned with housing, population density, parks and recreational facilities. The architect is interested in buildings (public and private) and the open spaces which provide a good setting for them and supply the needed light and air. The economist looks at trends in employment and volume and types of business and industrial activity without which the city could not exist. These interests are not mutually exclusive, nor need they conflict. A good city plan synthesizes them all."

F. Scope. If city planning is to be recognized as a separate profession, its scope must be established. This has not been done effectively. City planning is considered by some practitioners to be a broad field—so extensive in fact, that some who claim to be in the field have refused to define it. However, to gain professional recognition, the scope of the field must be established.

The word "scope" implies "fencing in" some area or type of work that is distinct. The building of a fence also "fences out" other areas or other approaches to the problems. Planners must be willing to define the scope of their function in order to establish professional standing, especially if they wish recognition through legislation.

*Bartholomew, Harland: "Is the Growth of Our Cities Properly Guided?" Civil Engineering, Oct., 1951, p. 46 (Vol. p. 596).

There are overlappings of interest and of competence of the several professional groups engaged in the city planning field. These overlappings have become more pronounced with the increased number of persons with disciplines in the social sciences coming into the planning field in recent years. Those with training in the social sciences have in general placed less emphasis upon physical design than have the groups in the physical science disciplines such as engineering, architecture, and landscape architecture. The differing backgrounds and approaches of the various groups in the planning field make it difficult to establish a scope for the field of city planning. The fact that city planning comprises a synthesis rather than an analysis of the various divisions of the work and that some planners are "generalized" rather than "specialized" in their education, tends to contribute to the difficulty in establishing a scope.

The dilemma facing planners in deciding upon scope with a view towards legislation recognizing a distinct professional field is whether to claim the scope to be comparatively narrow on the one hand or comparatively broad on the other hand. If a comparatively narrow scope is proposed, what shall it be? How many of the several groups represented in planning work could qualify? Would the various groups be satisfied with a narrow scope? On the other hand, if a wide scope is proposed, might it not conflict with areas already pre-empted by other professional groups?

Wherever the "fence" is placed, the areas outside the fence would have to be recognized as belonging to some other group. This "fencing out" means that planners recognize that other fields are different and that the planner does not consider his field of specialized knowledge so extensive as to invade the proper spheres of other professions. For example, it should be recognized that the city planner is not trained to perform all phases of the work of the traffic engineer. Nor is the city planner trained to perform all phases of the work of the highway engineer, the structural engineer, the sanitary engineer, the architect, or the landscape architect.

At the present time city planning is a wide open field. There is no recognition of city planning by registration or licensing boards as is the case for professional engineering and architecture. Recruiting into positions in city planning organizations is from professions such as engineering, architecture, and landscape architecture as well as from those with degrees in planning.

In many ways it may be desirable to maintain the field of city planning on a wide open basis so that contributions to the development of the work can be made by various professional groups. On a wide open basis, city planning may be made the means of synthesizing the ramifications of the subject in more remote fields ranging from finance to legal authority to esthetics.

G. Opportunities in City Planning. The rapid increase in concentration of the population of the country in urban communities and metropolitan regions brings about an increasing need for men trained with a comprehensive approach to problems of transportation, public works and buildings, land use, housing, industrial location, recreation, and other kinds of urban development.

H. City Planning and the Future. There is no magic in the idea of "planning;" nevertheless the concept of city planning as the organized preparation for decisions concerning improvement of environment, concerning the effective use of land, concerning the coordination of all forms of transportation, and concerning the attainment of physical efficiency of our cities, is

sound and worthy of support, and undoubtedly will increase in importance in the future.

III. The Role of the Civil Engineer as a City Planner.

A. Two Types of Activity. The role of the civil engineer as a city planner may be considered to comprise two general types of activity. There is first the work of the civil engineer as a "specialist" in various aspects of city planning work such as that of planning, designing and constructing public works and utilities, and of laying out transportation systems, airports, streets, subdivisions and industrial developments, and of preparing long-range capital budgets. Second, there is the work of the civil engineer who by experience and education has become qualified as a "generalist" in city planning; in this type of activity the civil engineer as a city planner acts to synthesize the contributions from various groups and professions.

In further explanation as to the meaning of "generalist" in city planning the following statement by Professor H. V. Hubbard is given.*

"What then is the city planner? He is not an inspired prophet, to whom all wisdom as to cities has been revealed. Rather he is the trained recorder of the decision of a big committee—the man who can understand how all the requirements of the community may fit together to make one workable scheme, and who has the technique to record the decision, in words or on plans, so that the scheme may be worked out, consistently but flexibly, by those who come after him."

B. The Civil Engineer as a Specialist. In the first category there should be no question as to the qualifications of civil engineers to perform the work of the "specialist" in designing and laying out public works, transportation systems, and industrial developments.

The responsibility of the civil engineer in the development of cities has been stated by Mr. Charles A. Blessing, former Chairman of the City Planning Division, in the Newsletter dated June, 1955:

"The responsibility of the civil engineer in the development and redevelopment of American cities is a fundamental responsibility when one considers the vast importance of expressways now rapidly being constructed in all large American cities, the changes in basic patterns of American cities as a result of the greatly expanded programs of redevelopment, and the impact on the future growth and welfare of metropolitan regions of all major public works planned and designed by civil engineers. In the expansion of metropolitan water and sewer systems, the development of planned industrial districts, major shopping centers and entire residential communities, the civil engineer has a primary responsibility. While recognizing the special contribution of the architectural profession and the emerging city planning profession, the civil engineer has rightly assumed his place in the city planning field in all matters relating to the planning and construction of buildings, highways, and facilities for other forms of transportation including airports, railroad facilities and rapid transit facilities."

*Hubbard, H. V.: "City Planning Education for the Professional City Planner." Proc. ASCE City Planning Division, Dec. 1929, pp. 2527-2529.

C. The Civil Engineer as a City Planner. With respect to the role of the civil engineer in the second category as a "generalist" in city planning, there are many examples of civil engineers who have had careers as city planners and who have made important contributions in the development of principles and their fulfillment in the practice of city planning. Mr. Charles A. Blessing, in the City Planning Division Newsletter of June, 1955, states:

"The Division can take real pride in the high professional quality of its programs maintained since it was established in 1923. Much of the pioneer work in the development of city planning in this country, can be traced to the work of such members as E. P. Goodrich, Russell Van Nest Black, Harland Bartholomew, Robert Whitten, Ulysses S. Grant, III, Morris Knowles, John Nolen, and Harold Lewis, who have achieved outstanding reputations in the city planning field. The 116 papers indexed in the first Handbook of the City Planning Division published in 1938, contain a wealth of basic thinking on which rests the practice of city planning in this country today."

Reference should be made to the ASCE paper by Mr. Harry W. Alexander entitled "History of the City Planning Division of the ASCE" Separate No. 509, for a statement of accomplishments of civil engineers in the development of city planning.

D. Engineers' Contribution in Developing American Cities. A paper entitled "Engineers' Contribution in Developing American Cities" * was delivered by Mr. Harold M. Lewis at the Centennial of the ASCE in 1952. In this paper Mr. Lewis describes the contributions of civil engineers to city planning and the relationships between municipal engineering and city planning.

Major General Ulysses S. Grant III has called attention to "the important part played by engineers in the proper development of the nation's capital."**— "Of course, other professional men—the architects, sculptors, landscape architects, and city planners—have played appropriate parts in the development of the city; but the contribution of the engineer has been greater here than elsewhere. The engineering profession has a special responsibility to maintain this contribution in the future on the same high level."

E. The Engineer in British Town Planning. It is of interest to note that a predominantly architectural-engineering staff is employed in the Housing Ministry in Great Britain. The following quotation from Columbia Planner News Letter** is given. "Mr. (Samuel R.) Mozes was received by S.L.G. Beaufoy, Chief Technical Planner in the Housing Ministry, who offered considerable background information for understanding the processes of British town planning.—With respect to the organizational set-up of the planning services, the Chief Planner explained that a predominantly architectural-engineering staff was employed by the Ministry. Planners of a background other than architectural or engineering were considered of limited usefulness."

*Lewis, Harold M.: "Engineers' Contribution in Developing American Cities" Centennial Transactions Vo. CT, 1953, Paper No. 2584, p. 182.

**Grant, U. S. III: "Planning the National Capital: Objectives and Problems of Attainment." ASCE Separate No. 64, Vol. 77, April, 1951.

***Columbia Planners News Letter, No. 4, June, 1955, p. 8.

F. Criticisms of the Qualifications of Engineers in City Planning. The Civil Engineer should not assume that all groups in the planning field regard him as being well trained and qualified to perform city planning work, but should understand that there are those who claim that the city planning problems of today cannot be solved by engineers. For example, a sheet advertising the Program of Education and Research in Planning at the University of Chicago, entitled "There is a Job Ahead in City Planning" states - - - "These are not problems that can be solved by architects and engineers."

It may be soundly argued that those advocating training primarily in social sciences have not yet demonstrated that there exists a superiority in solving city planning problems among those educated in social sciences, as compared to those with a background in physical sciences. But regardless of this, the point to be noted by the civil engineer is that there is competition in the field of city planning and that in order to meet that competition, civil engineering students should be given training in the principles and practice of city planning. It is also desirable that civil engineering students study courses in sociological and economic problems relating to cities.

G. Recognition of City Planning by the ASCE and ECPD. The role of the civil engineer as a city planner should be recognized first of all by the American Society of Civil Engineers. The backing of the American Society of Civil Engineers is needed in order to have city planning recognized as a division of civil engineering in the Colleges of Engineering in the United States. Many departments of civil engineering do not recognize city planning in any way. In fact, the Civil Engineering Division of the American Society for Engineering Education does not recognize city planning as a field of work in civil engineering. The fields that the ASEE do recognize are transportation, surveying, structural, hydraulic, sanitary, soil mechanics, and construction—but not CITY PLANNING. Similarly, but little recognition is given to city planning by the ECPD in accrediting curricula in civil engineering in engineering colleges. The American Society of Civil Engineers should call the attention of the ECPD to this deficiency and as a society member of the ECPD, should insist on some instruction in city planning being offered for civil engineering students in accredited curricula in civil engineering.

If the role of the civil engineer in city planning is not stressed by the American Society of Civil Engineers, the trend will be for other groups to become dominant in the city planning field.

H. The Civil Engineer as a Teacher of City Planning. In view of the role of the civil engineer in the field of city planning both as a "specialist" and as a "generalist", the civil engineer is qualified to make contributions as a teacher of city planning. As discussed in Section III, A and B, the civil engineer as a "specialist" engages in various aspects of city planning work such as that of planning, designing and constructing public works and utilities, and of laying out transportation systems, airports, streets, subdivisions and industrial developments. In Section III, C, it has been pointed out that as "generalists" civil engineers have made important contributions to the development of principles and their fulfillment in the practice of city planning. Professors of civil engineering with suitable education and experience in the above fields are well qualified to teach city planning courses.

In universities and colleges where separate departments of city and regional planning are established for instruction of students majoring in city and regional planning, a number of the courses can be taught advantageously by professors of civil engineering with proper qualifications. Also where a

number of the departments in a university or college are cooperating in an interdepartmental program of instruction for students majoring in city and regional planning, the department of civil engineering should be included and should offer courses.

A department of civil engineering should teach planning subjects pertaining to transportation and construction and to the functional efficiency of cities. These subjects should include transportation of persons and commodities, design and construction of public works and utilities, site planning and design of buildings, housing, structures and facilities involving space requirements, and layout and arrangement of industrial, commercial, and residential areas. Principles of developing physical facilities to produce desired social results at the most economical cost should be stressed. In addition to the above "specialist" courses, the professor of civil engineering trained and experienced in city planning is well qualified to teach "generalist" courses in city planning.

A student majoring in city and regional planning should be trained not only as a "generalist" in city planning but also as a "specialist" in some branch of the work. A planning student electing a "specialist" group of courses would enhance his usefulness in practice.

Courses pertaining to functional efficiency of cities as described above constitute an important group of "specialist" courses that should be taught by departments of civil engineering. Universities with separate planning departments or interdepartmental programs in planning should utilize the staffs and facilities of their departments of civil engineering.

The Committee on Education of the City Planning Division recommends that in universities, the department of civil engineering be included with other schools and departments in the organization and expansion of city planning programs.

IV. A Review of the Joint ASPO-AIP-Bettman Foundation Report

A. The publication of the report on "Urban Planning Education in the United States" by Professor Frederick J. Adams in 1954 has created a great deal of interest among all professional groups concerned with city planning. This report is a project of The Alfred Bettman Foundation of Cincinnati, Ohio. The American Society of Planning Officials and the American Institute of Planners were cooperating organizations. The report is referred to as the joint ASPO-AIP-Bettman Foundation Report. It will be called the Adams Report for the sake of brevity.

B. One of the main purposes of this report on "City Planning Education for the Civil Engineer" is to review the joint ASPO-AIP-Bettman Foundation Report on education for planners; also to consider that report in the light of the role that engineering schools should play in training engineers for the planning profession and in acquainting them with it.

C. The Adams Report concerns itself primarily with the education of professional planners and only incidentally with the education of students majoring in allied fields who wish to engage in the practice of city planning. However, the Adams Report in the summary of recommendations, section 6, fourth paragraph (page IX), has the following statement concerning "special programs in planning."

"Efforts should be made to increase the number of options or majors in planning offered by departments of architecture, landscape architecture,

civil engineering, public administration and other fields, not only to provide a better basis for further academic work in planning at the graduate level but to help in meeting the need for planning specialists in the larger offices."

It is believed that this recommendation in the Adams Report should receive the endorsement of the American Society of Civil Engineers and that it should be called to the attention of the faculties of all civil engineering departments in colleges and universities in the United States.

D. Professor Adams makes the following recommendation (page VIII) concerning evening courses: "Evening courses, such as those available at Columbia (University) and the New School for Social Research in New York City, should be provided by planning schools in other metropolitan centers to provide for persons working in private offices or public agencies who are not in a position to enroll as full-time students in the universities. Such courses are in increasing demand and provide a sound way for helping to meet the need for qualified personnel. Whether such a program should lead to a certificate or to an academic degree is still an open question."

The above recommendation should be endorsed by the American Society of Civil Engineers.

An example of an evening graduate program where a city planning course is taught is the University of Wisconsin Graduate Engineering Evening Program in Milwaukee, Wisconsin. One of the curricula offered for the Master of Science in Civil Engineering degree is in Municipal Engineering. A course in city planning is offered in that curriculum. Most of the students enrolled in the city planning course are civil engineers who have the Bachelor of Science in Civil Engineering degree. At least three years of evening study including a thesis is required for the Master of Science in Civil Engineering degree.

E. Another recommendation by Professor Adams (page IX) concerning special programs in planning is:

"Encouragement should be given to the establishment of short courses or institutes, on a regional basis, to bring together practitioners in various fields for a discussion of planning problems of mutual concern and to enable practicing planners to keep up with developments in planning techniques and procedures."

This recommendation should also be endorsed by the American Society of Civil Engineers. Engineering societies and colleges and universities should take part in sponsoring such short courses and institutes.

Examples are the Regional Municipal Training Schools for Planning Officials and Employees conducted by the Municipal Training Institute of New York State.

Another example is the Conferences on City and Regional Planning conducted by the University of Wisconsin as well as Engineering Institutes on Surveying and on Traffic Engineering in which city planning subjects are covered.

F. On page 24, last paragraph of the Adams Report, the statement is made:

"-----In any case, a workable program of accreditation must await a definition of the field of planning whether urban or regional, which will not only have the full support of the professional groups involved but can be readily identified as a separate and distinct field of endeavor by members of a legislative body."

The above statement is agreed to by the Committee on Education of the City Planning Division, ASCE. It is possible to define the scope of city planning where physical planning is emphasized; but today with the field of planning enlarged in scope to include contributions by those from the field of social sciences, it is difficult to establish a scope that would cover the field of planning to the satisfaction of all those engaged in planning. Since this is the case, it is agreed that the time is not ripe for a workable program of accreditation of professional planning curricula. In view of this situation, it is believed that it is important for civil engineering students to be given some training and education in city planning so that they as practicing engineers can help develop the work of planning cities.

It is implied in the statement above by Professor Adams that registration of professional planners as members of a separate and distinct field of endeavor by a legislative body will not be achieved in the near future. It is desired to point out, however, that the American Institute of Planners has a national committee which is studying the subject of registration of planners. Also it is of interest to note that a bill was introduced in the 1955 Legislature of the State of California to provide for the registration of planners in California; this bill was prepared by a Committee on which local members of the American Institute of Planners were represented. No doubt other bills will be introduced in other states. It is believed, however, that registration of planners as members of a separate and distinct field will not soon be accomplished throughout the states of the nation.

In the meantime this situation should encourage young men who wish to become professional planners to study a recognized professional field such as civil engineering or architecture and pursue study in planning. In this way the individual could become registered as a professional engineer or architect, thereby attaining professional standing, and at the same time be qualified as a planner. This plan has many practical advantages.

A combined curriculum in civil engineering and city planning at the University of Wisconsin requiring five years is an example of a coordinated course of study in both civil engineering and city planning. (See Appendix B.) A graduate in civil engineering can of course pursue a graduate course in city planning and regional planning, becoming qualified in both civil engineering and city planning.

There are societies and associations of planners in many large cities in the United States with which the young planner can affiliate. But in medium-sized and small cities, such groups rarely exist. Engineering societies such as the ASCE, NSPE, and others are larger and are operating sections in medium-sized cities as well as some small cities. By being registered as a professional engineer, the individual can maintain professional associations regardless of his residence. This is an important practical point in the development of the younger men in that it makes possible valuable professional associations.

V. Training the Civil Engineer for City Planning Practice

A. General. Education in city planning should be concerned with the logic and character of the planning function and the study of courses of action involved in planning practice.

A curriculum in city planning should enable the student to obtain a broad understanding of the physical, sociological, and economic problems of city

planning and sufficient technical skill to qualify the student for positions as city planners and staff members with planning consultants and agencies. The objective in educating a city planning student is to provide a broad background of knowledge in physical, sociological, and economic aspects of the subject and yet develop certain technical skills that will enable the individual to obtain employment upon leaving college.

B. Training as a Specialist. Training the civil engineering student for the practice of city planning comprises two categories: (1) Training as a "specialist"; and (2) training as a "generalist" in city planning. These two types of activity have been described in Section III.

The education of the civil engineering student as a civil engineer to serve as a "specialist" in city planning will be considered first. It is believed that present curricula in civil engineering accredited by the Engineers' Council for Professional Development provide for the education of civil engineering students to perform as designers and constructors of public works. However, there is a danger that trends in engineering education may modify the curriculum in civil engineering so that students graduating in civil engineering would not be adequately educated for responsible positions in public works. This danger is pointed out in the recent A.S.C.E. paper by Professor Benjamin A. Whistler.*

Professor Whistler points out that "the historical development of the field of civil engineering has resulted in civil engineering's being closely associated with public works." The field of civil engineering is very different from other fields of engineering such as mechanical and electrical engineering which deal with mass-production industries where research and development are important.

"Present trends in engineering education are toward the inclusion of much more mathematics, physics (including atomic physics), theoretical mechanics, and similar courses. These courses are being expanded in order to prepare the graduate engineer for entry into development and research activities and are at the expense of those courses which emphasize the truly engineering aspects of the curricula. We are approaching the point where our students will be trained only as scientists and not as engineers."

"When we are considering engineering curricula, let us remember that the field of civil engineering is very different from other fields of engineering. The civil engineer is apt to work for a public agency, in construction, by himself, and he is apt to have a wide variety of problems in his day's work. Let us not pattern our civil engineering education after the engineering education of the mass-production industries where research and development positions have become predominant, but let us continue to design our civil engineering education for civil engineers."

The above quotations from the paper by Professor Whistler should be of particular interest to members of the City Planning Division of the American Society of Civil Engineers because of the close relationship between public works and city planning. It is the judgment of the Committee on Education, City Planning Division, ASCE that the curriculum in civil engineering should continue to provide for training in the layout, design, and construction of public works and similar municipal projects. This is essential if the civil

*Whistler, Benjamin A.: "Education of Civil Engineers: Training for Civil Engineering." ASCE Paper No. 859, Vol. 81, Dec., 1955.

engineer is to continue in his function as a "specialist" in city planning activity.

C. Training as a "Generalist" in City Planning. In the second category as a "generalist" in city planning, it is believed that the civil engineering student needs to study courses in the principles and practice of city planning while in college. Although a number of civil engineers in the past have achieved prominence as city planners without the benefit of instruction in city planning in college, it is believed that under modern conditions that such education in city planning is desirable if civil engineers are to maintain positions of leadership in the practice of city planning.

D. Education in Civil Engineering as a Preparation for City Planning. The civil engineer has specialized training that is valuable in city planning work. Indeed, many would claim that it is highly desirable that one going as a professional man in the planning field should have some specialized training prior to undertaking the study and practice of a field so broad as that of city planning.

An analogy may be made with experience in the field of agricultural extension where it has been found desirable to employ "specialists" in the agricultural extension field work rather than to send out "generalists" to advise the farmers in their problems.

It is much easier and more effective to train specialists to become proficient in the general features of the field than to attempt to train "generalists" to become "specialists" in some particular field.

Young engineering graduates can at once enter into drafting work, the conduct of surveys, and the execution of simple designs. As he gains experience, he can attack problems of greater difficulty. Students educated as generalists with little training in physical design have difficulty in getting started in planning offices and organizations. An analogy may be made with the problem facing colleges of commerce wherein it must be determined whether the curriculum should be aimed at educating future executives of corporations or at training the students in certain skills useful in obtaining employment in a business office.

The engineering student in a typical civil engineering curriculum in the United States gets sufficient instruction to enable him to do drafting and surveying work. This proficiency is considered to be highly desirable for those young engineers wishing to enter the city planning field.

It is believed that education as a civil engineer is excellent preparation for further study in the field of city planning.

If the civil engineering student intends to go into the city planning field, he should be given instruction in his college course concerning the principles and practice of city planning at least to the extent of a course or two in the subject. Additional instruction in city planning at the undergraduate or graduate level covering an additional year or two would be highly desirable.

E. Municipal Engineering. A great number of civil engineers are employed in the field of municipal engineering. Municipal engineering comprises a field of work where city planning (including land subdivision and zoning), highway engineering, traffic engineering, sanitary engineering, illuminating engineering, building construction and inspection, and public works and public utilities are involved. In large cities the above divisions of municipal engineering are specialized and engineers with specialized training are desired for employment. However, in medium-sized and small cities, the municipal engineering organization is less specialized and the municipal

engineers employed in these smaller cities are called upon to work in the various phases of municipal engineering. Education in city planning is important for municipal engineers employed in medium-sized and small cities, although it should be of value and great interest to all engineers engaged in municipal engineering. It is recommended that one or more courses in city planning be included in the curriculum in civil engineering departments for the education of both undergraduate and graduate students preparing for positions in municipal engineering.

F. Instruction in City Planning for Civil Engineering Students. The Committee on Education recognized that many engineers, although trained in many phases of engineering pertaining to city planning work, do not have as specific an education in city planning as might be desired. Accordingly, the Committee on Education believes that, although many features in the usual curriculum for a bachelor's degree in civil engineering are related to city planning work, there should be definite courses in city planning offered to all students in civil engineering in all recognized and accredited colleges of engineering.

G. Programs of Instruction in City Planning. Four types of programs of instruction in city planning for the benefit of civil engineering students are now in operation.

The first type comprises one or more courses in the principles and practice of city planning which are offered to civil engineering students during the regular undergraduate course in civil engineering. Appendix A gives course descriptions of city planning courses taught by the department of civil engineering of the University of Wisconsin.

The second type consists of an undergraduate program in city planning which is or may be coordinated with the undergraduate curriculum in civil engineering. The five-year combined curriculum in civil engineering and city planning of the University of Wisconsin is shown in Appendix B. It will be noted that the requirements for the degree of Bachelor of Science in City Planning consist of the requirements for the degree of Bachelor of Science in Civil Engineering plus certain other courses to be taken normally during the third, fourth and fifth years. These additional required courses are:

CIVIL ENGINEERING: City Planning. Advanced City Planning.
City Planning Design. Municipal Engineering Practice. Traffic Control. Airports.

ART HISTORY: American Architecture

GEOGRAPHY: Urban Geography

SOCIOLOGY: World Population Problems. Planning and Social Organization.

ECONOMICS: Economic Statistics. Outlines of Land Economics. Urban Land Economics. Public Finance.

POLITICAL SCIENCE: Municipal Government. Local Planning Administration.

SPEECH: Public Speaking

This combined course is designed to provide needed professional training for civil engineering students who expect to engage in municipal engineering

work and in city planning. A man with this training may be especially valuable in the small city or the good-sized village which cannot afford to hire both a municipal engineer and a full-time professional planner. A civil engineering student who completes the work for the degree in city planning is more broadly equipped to lead or to participate more effectively in the important tasks of long-range city planning.

The third type is a two-year graduate program in city planning leading to the degree of Master of City Planning (or Master of Regional Planning). A number of these programs are described in the joint ASPO-AIP-Bettman Foundation report. A civil engineering graduate would profit a great deal by graduate study in a program of the third type. Ordinarily civil engineering graduates would be able to complete a program of this type in two academic years. In some cases summer practical work is also required.

The fourth type, available in the University of Wisconsin, is a graduate program in civil engineering with specialization in city planning leading to the degree of Master of Science in Civil Engineering. Most Graduate Schools select graduate students with regard to their scholarship records in undergraduate programs. Ordinarily the Bachelor of Science in Civil Engineering is required for entry into this program as a candidate for the degree of Master of Science in Civil Engineering. Usually the length of course would be one academic year. A typical list of courses comprising 24 semester credits for this fourth type of program at the University of Wisconsin is as follows:

City Planning
Advanced City Planning
City Planning Design
Urban Land Economics
Housing and Planning
Seminar in Regional Planning
Municipal Engineering Practice
Traffic Control
Thesis (for Master's degree)

The following list of alternate courses is also available at the University of Wisconsin:

Alternates
Modern Population Problems
Local Planning Administration
Economics Statistics
Public Finance
Seminar in River Basin Planning
Courses in highway engineering and in sanitary engineering

Civil engineering students interested in entering the city planning field should be encouraged to undertake some study in college in city planning. Civil engineering students would be broadened by taking the longer programs but would profit somewhat by enrollment in the shorter programs.

In institutions with separate departments of city planning, arrangements should be made for establishing courses in city planning suitable for civil engineering students.

Candidates for the Ph.D. degree in civil engineering may find courses in city planning suitable as a minor field of study.

H. Graduate study for Professional Recognition. In discussing graduate study as professional education, Professor L. E. Grinter* in a recent ASCE paper states: "To achieve the appropriate status of a professional engineer, the engineering graduate has the choice of graduate study or of further self-education. It appears to be the trend for most professions to require either the Master's degree or its equivalent in formal study before professional recognition is awarded. In engineering, where only a fraction of the graduates appear to desire professional recognition, since attractive employment outside the professional field is readily available, there would be an obvious advantage in retaining the bachelor's degree in engineering as a normal termination for those who do not seek professional recognition while establishing the master's degree as the normal channel for those who intend to become professional engineers."

The preceding statement indicates interest in graduate study as a preparation for professional recognition in engineering. In case this development in graduate study gains widespread acceptance, it would seem desirable for the City Planning Division of the ASCE to emphasize that graduate study in city planning would be helpful to those desiring to obtain recognition as professional engineers and city planners.

VI. Conclusions

A. The importance of the field of city planning should be clearly presented to civil engineering students.

B. Courses in city planning should be available to students in civil engineering in all colleges of engineering. Such courses should be carefully designed to provide instruction in modern concepts and practices of city planning. They should be taught by instructors with training and experience in city planning.

C. The division of city planning in departments of civil engineering in colleges of engineering should be placed on an equal standing with the divisions of structural, hydraulic, sanitary, highway, transportation, and construction engineering, soil mechanics and foundations, and surveying.

D. In universities, the department of civil engineering should be included with other schools and departments in the organization and expansion of city planning programs.

E. Encouragement should be given to civil engineering students who are interested in practicing city planning to enroll in curricula leading to degrees in city or regional planning either on a graduate or undergraduate basis.

Respectfully submitted,
Harry W. Alexander
Willard F. Babcock
Harold M. Lewis
Samuel S. Steinberg
Lloyd F. Rader, Chairman
Committee on Education of the City
Planning Division

*Grinter, L. E.: "Education of Civil Engineers: Need for Reconsideration," ASCE Paper No. 858, Vol. 81, Dec., 1955.

APPENDIX A

The University of Wisconsin
Department of Civil Engineering

City Planning

141. City Planning. 2 cr. History of city planning; classes and use of streets; land subdivisions; transit and transportation systems; parks and playgrounds; public buildings; housing; zoning. A design project is assigned. Prerequisite: Sophomore standing. Mr. Rader. Textbook: "Planning the Modern City," by Harold M. Lewis, Volume 1. John Wiley and Sons, Publisher.

142. Advanced City Planning. 2 cr. Neighborhood and community planning; housing; redevelopment of blighted areas; decentralization of industry and residence; control of land subdivision; planning for the urban region; selection and design of sites for neighborhood units, public buildings, transportation terminals, airports, motor vehicle parking, parks, and recreational facilities; financing municipal improvements; legislation; administrative problems. Design projects are assigned. Prerequisite: C.E. 141. Mr. Rader. Textbook: "Planning the Modern City," by Harold M. Lewis, Volume 2. John Wiley and Sons, Publishers.

143. City Planning Design. 2 cr. Field surveys and office design of subdivision layouts including public improvements and utilities; site plans for buildings and structures; layouts for transportation terminals, motor vehicle parking, parks and recreational facilities. Prerequisite: C.E. 142. Mr. Rader.

APPENDIX B

The University of Wisconsin
COMBINED CURRICULUM IN
CIVIL ENGINEERING AND CITY PLANNING

Leading to the Degrees of Bachelor of Science (Civil Engineering) and Bachelor of Science (City Planning)*

The five-year combined curriculum in Civil Engineering and City Planning is designed to provide professional training in city planning for students who are enrolled in the civil engineering course. Related courses of instruction that are offered will enable students to obtain a broad understanding of the physical, sociological, and economic problems of city planning with sufficient technical skill to qualify them for positions as city planning engineers, municipal engineers, and staff members with planning consultants and agencies.

*The degrees will be granted at the end of the fifth year upon completion of requirements.

FRESHMAN YEAR

First Semester

Math. 51	Elementary analysis	5 cr.
Drawing 12	Engineering drawing	3
Chem. 2a	General chemistry	4
Engl. 1a	Freshman composition	3
C.E. 15	Elementary surveying	2
Freshman Lectures		0
Physical Education		0
Military Training		0
		<u>17 cr.</u>

Second Semester

Math. 52	Elementary analysis	5 cr.
Drawing 23	Engineering drawing and descriptive geometry	3
Chem. 2b	General chemistry	4
Engl. 1b	Freshman composition	3
C.E. 16	Elementary surveying	2
Physical Education		0
Military Training		0
		<u>17 cr.</u>

SOPHOMORE YEAR

First Semester

Math. 102a	Calculus	4 cr.
Physics 51	General physics	5
Mech. 1	Statics	3
C.E. 17	Topographical and land surveying	3
Econ. 1a	General economics	4
Military Training		0
		<u>19 cr.</u>

Second Semester

Math. 102b	Calculus	4 cr.
Physics 52	General physics	5
Mech. 2	Dynamics	3
C.E. 23	Curves and location	3
C.E. 99	Engineering reports	3
Military Training		0
		<u>18 cr.</u>

ASCE	CITY PLANNING EDUCATION	1877-19
SUMMER CAMP (6 WEEKS)		
C.E. 116	Summer survey	4 cr.
C.E. 122	Route surveying	2 cr.

JUNIOR YEAR

First Semester

Geology 9a	Engineering geology	3 cr.
Mech. 3	Mechanics of materials	4
Mech. 51	Materials of construction	2
*Econ. 117	Outlines of land economics	3
*C.E. 141	City Planning	2
C.E. 72	Elementary hydraulics	<u>4</u>
		18 cr.

Second Semester

Mech. 52	Materials of construction	2 cr.
C.E. 132	Highway engineering	3
*C.E. 142	Advanced city planning	2
*Econ. 130	Economics statistics	3
*Econ. 179	Urban land economics	3
*Geography 129	Urban geography	3
*Sociology 171	Planning and social organization	<u>3</u>
		19 cr.

SENIOR YEAR

First Semester

M.E. 67	Thermodynamics and heat-power	4 cr.
C.E. 181	Hydrology	2
*C.E. 144	Municipal engineering practice	2
*Art History 131	American architecture	3
*Econ. 124a	Public finance	3
*Pol. Science 13	Municipal government	3
*Sociology 163	World population problems	<u>3</u>
		20 cr.

*The requirements for the degree of Bachelor of Science in City Planning consist of the requirements for the degree of Bachelor of Science in Civil Engineering and the courses indicated by the asterisk in the combined course curriculum.

Second Semester

C.E. 52	Structural analysis	3 cr.
C.E. 155	Reinforced concrete	3
C.E. 191	Sewerage and sewage treatment	3
*C.E. 145	Traffic control	2
C.E. 103	Economic selection	2
*Pol. Science 163	Local planning administration	3
*Speech 7	Public speaking	2
Junior trip (C.E.)		0
		<u>18 cr.</u>

FIFTH YEAR

First Semester

*C.E. 139	Airports	2 cr.
*C.E. 143	City planning design	2
C.E. 53	Structural design	3
C.E. 195	Water supply	3
C.E. 100	Thesis	1
C.E. 160	Advanced reinforced concrete	2
Mech. 110	Soil mechanics	3
Electives		3
Senior trip (C.E.)		0
		<u>19 cr.</u>

Second Semester

C.E. 54	Structural design	2 cr.
C.E. 101	Contracts and specifications	2
C.E. 164	Foundations	2
C.E. 100	Thesis	2
E.E. 10-60	Elementary electrical engineering	4
Electives		7
		<u>19 cr.</u>

Total - 190 credits

APPENDIX C

STATEMENT BY J. CAL CALLAHAN
Chairman, City Planning Division, ASCE

The report of the Education Committee of the City Planning Division of the American Society of Civil Engineers reviewing the joint ASPO-AIP-Bettman Foundation Report on education for planners is of primary interest to all practitioners of city planning.

This report probes the status of city planning as a profession and comes to focus on the core problem which is the need for legislative recognition.

In the words of Professor Rader:

"If city planning is to be recognized as a separate profession its scope must be established. This has not been done effectively. City planning is considered by some practitioners to be a broad field, so extensive in fact, that some who claim to be in the field have refused to define it. However, to gain professional recognition, the scope of the field must be established."

Supported by the words of Professor Adams:

"In any case, a workable program of accreditation must await a definition of the field of planning which will not only have the full support of the professional groups involved but can be readily identified as a separate and distinct field of endeavor by members of a legislative body."

Thus stated we have, although a difficult problem, an obvious point of beginning.

In recent intersociety correspondence Mr. William Wisely stated: "You can count upon the wholehearted support of the A.S.C.E. in furthering the professional and technical interests of the city planning field, including the enhancement of friendly and cooperative relationships among all of the elements that are concerned in the improvement of urban environments."

As part of a professional society founded in 1852 it appears logical for the City Planning Division, now in its 35th year, to provide a channel for the professional groups involved to establish and support a definition of the field that will clear the way for legislative recognition of city planning as a profession.

It is a pleasure to extend to Professor Rader and his committee the appreciation of the Division for a job well done.



Journal of the
CITY PLANNING DIVISION
Proceedings of the American Society of Civil Engineers

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Note: Paper 1885 is part of the copyrighted Journal of the City Planning Division,
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December, 1958.



ASPECTS OF URBAN PLANNING^a

Discussions by Nathan Cherniack, Wm. H. Claire and Joseph Horowitz
Closure by Sergei N. Grimm

NATHAN CHERNIACK,¹ M. ASCE.—City planners should be grateful to Mr. Grimm for his frank, penetrating, and soul-searching paper. Although only indirectly, his paper does disclose a number of reasons why city planners have had to accept many frustrations while trying to carry out their plans for improving urban areas.

The author has wisely set forth precepts for effective planning, a number of which can stand repetition and are here rephrased:

1. The general purpose of land planning is to achieve arrangements of land uses that will assure economical provision of transportation facilities, utilities, and other community facilities necessary for the efficient functioning of the community;
2. Public bodies have a duty to both residential and industrial users alike to work out the problem of incompatibility between them;
3. Under the American social, economic system, most decisions lie in the domain of private decision making;
4. Land use and transportation are intermittently interrelated, they are separate in terms but are actually two functional aspects of a single broad concept;
5. Because technological progress has been changing land uses constantly, planning must consequently be a continuing function, subject to continual changes; and
6. Positive devices do exist to enable and encourage development along the lines of public objective, among which is the making available to certain private groups the benefits of the public power of eminent domain.

It is now proposed to utilize these precepts in suggesting a generalized, but positive, action program for redeveloping existing obsolete built-up urban areas.

Today in most urban areas, particularly beyond the central business district, existing core areas, devoted to commercial and industrial activities, suffer from a number of acutely serious obsolescences. These core areas are usually too intensively utilized for building bulk. As a consequence, they do not have adequate trafficways that can function as corridors for through movements of vehicles and, at the same time, have enough space for maneuvering on existing streets. These areas also have far too little off-street

a. Proc. Paper 1620, April, 1958, by Sergei N. Grimm.

1. Economist, The Port of New York Authority, N. Y., N. Y.

space available for truck loading berths, for parking of trucks while waiting to load or unload, and for parking autos of employees and visitors to buildings. These areas are usually fragmentized into small parcels devoted to commercial and industrial activities honeycombed with low-income dwellings. There is usually not enough undeveloped or vacant areas for any substantial expansion by any of the non-residential occupants who may desire to remain in these areas, even under existing handicaps.

In order to eliminate these glaring obsolescences of the motor age in urban areas throughout the United States, in a way which would work to the mutual benefit of both municipalities and private interests, it seems imperative to carry through cooperatively, the following type of suggested program of planning in action:

Assemble large tracts of blighted urban land for redevelopment for industrial uses exclusively, and then insulate such newly assembled tracts entirely from residential occupancy within these areas. Relocate former tenants in completely new residential projects, insulated from industrial activities. Provide such tracts with adequate trafficways (a) to handle, freely, the required circulation within the areas, by tractor-trailers, autos and buses, as well as (b) to allow for easy maneuvering of tractor-trailers into and out of loading berths. Provide such tracts with off-street terminal space sufficient to park tractor-trailers at their loading berths as well as to park trucks while waiting for access to buildings and to park the autos of employees and visitors. Provide these areas also with rail sidings, wherever practicable to minimize truck hauls between railroad freight stations and these areas.

Such large assembled tracts with the above-indicated transport amenities would result in distinctly different apportionments of land within such tracts, but a much more realistic balance among (a) building areas; (b) off-street terminal facilities, and; (c) trafficways. Compared with similar existing tracts which usually allow about a third of such areas for streets and alleyways, proposed tracts would probably allow more than two-thirds for trafficways and terminal space and less than one-third for building areas. In the opinion of the writer, these new industrial areas would increase significantly the efficiencies of distribution to and from such areas. As a consequence, production efficiencies in such areas may be significantly stepped up. Such areas may then permit drastically reduced freight and passenger transport costs. These areas may thus tend to command higher unit land rental values than the blighted areas they would replace. Such higher rental yields may prove sufficient to permit the redevelopment of existing blighted core areas, if endowed with the suggested amenities, on an economically feasible basis, without the need for governmental subsidies.

To be successful, however, such redevelopment projects would have to enlist the cooperative efforts of municipal agencies, private realty developers and common carriers. (This type of effort would be, in effect, a three-legged economic stool.) No one of the three parties alone could, as a general rule, carry through successfully an urban redevelopment project such as is suggested above.

WM. H. CLAIRE,¹ M. ASCE.—Mr. Grimm has painted a word picture of the city planning process with broad brush strokes and documented urban planning methodology as he sees it in Syracuse.

1. Asst. Exec. Dir., The Community Redevelopment Agency of the City of Los Angeles, Calif.

The Journal of the City Planning Division has needed in its record a comprehensive description of the importance of planning and methods in current practice. Mr. Grimm has made a considerable contribution in this direction. Some of his statements need positive orientation and less of the negative slant.

Under the heading PLANNING PROCESS on page 3, this sentence appears. "At the very beginning, while research and surveys get under way, the planner begins to generate ideas which he thinks may work." This is bad but the next sentence is worse. "There's nothing wrong with this procedure." We will never correct our urban ills with this approach and I trust Mr. Grimm has in mind this "hypothesis method" is limited to a few inexperienced planners and is not the general practice of the profession. We cannot get these cities in shape for the population and technological impacts the future portends with such unrealistic and unscientific methods of planning. The wise planner researches and surveys each point involved before his plan is formulated and is guided thereby in that formulation. An engineering systems approach to planning is recognized as the answer to planning technique.

On page 4 under the heading TECHNICAL OPERATIONS VS. POLICY MAKING the planner is rightfully cautioned against "guessing" in making planning decisions. This approach seems to me to leave the impression that planning is a guessing game. This is hardly the case. An assumption can be carefully arrived at after a thorough review of the facts upon which the assumption is based. The scientific process of analysis and synthesis can take the guess-work out of planning. The important point here is to emphasize the necessity for leaving no stone unturned and having adequate reasons for each planning decision.

On page 5 under the heading GENERAL PLANNING the author touches on a subject on which all planners are not in harmonious agreement but one which is taking an increasingly important place in the planning process. A general plan is a must for any orderly development—whether it's a boy, a park, an airliner, or a city. The important aspects of a general plan for urban growth are how it is prepared and what it is used for after completion. The first aspect should control the second. The City of Los Angeles has set down the reasons for and objectives of a Generalized Land Use Plan so clearly and positively that they may be of help to planners and engineers to have them included as an Appendix to this discussion. This report was prepared by Tracy H. Abell under the supervision of John E. Roberts of the City Planning Department. The statistical data on various types of land use for 1924, 34, 44, and 54 are especially interesting. The communications elements of the general plan were prepared some years ago and include a Freeway Plan, Primary and Secondary Highways Plan, Utilities Plan, Terminal Plan, Airport Plan, and other elements.

In closing, these thoughts are intended not to judge but in a spirit of co-operation with Mr. Grimm to help in presenting positively a few important points about planning. The writer heartily concurs in his closing statements on the assistance of business in getting plans adopted and put into effect. This is par for Los Angeles where the Downtown Businessmen's Association, the Chamber of Commerce, and other commercial and industrial organizations are called upon to guide planning and help implement the final plans for a wide variety of urban development and redevelopment programs and projects.

APPENDIX

**Preliminary Report on a Land Use Plan for the City of Los Angeles
Master Plan Division—Los Angeles City Planning Department**

Land Use Plan Objectives

The purpose of the Proposed Plan for Land Use is to provide guidance for the accomplishment of five general objectives to be effectuated by the application of zone changes and through development by private enterprise and public works:

1. Functional Units

The division of the total area of the city into Use Areas arranged in a pattern which will afford the maximum convenience, comfort, safety and enjoyment of its people in the daily processes of living, working and leisure-time activities. These consist of:

a. Residential Neighborhoods

The improvement of existing and creation of new residential neighborhoods and communities in a range of types suited to the varied tastes of people and providing healthful, safe housing in an attractive open environment containing all the required conveniences and facilities, including a street pattern which discourages through traffic and provides protection from the hazards of heavy traffic and adverse non-residential uses and activities.

b. Industrial Areas

Provision for adequate industrial areas with sufficient room for expansion of large units, arranged for efficient production and circulation of workers and materials, located as conveniently as possible in relation to living areas of workers and with sufficient offstreet parking for their cars, but protected from encroachment of residential or other conflicting uses detrimental to the efficient operation of industry.

c. Commercial Districts and Shopping Centers

Establishment of new and redevelopment of existing commercial and shopping areas in locations convenient to users, arranged for traffic and pedestrian convenience and safety, with adequate offstreet parking and encouraging the establishment of attractive structures in pleasant surroundings; also the curtailment of ribbon-type commercial uses along major streets and the conversion of existing commercial ribbons into more profitable uses arranged to facilitate rather than to hinder traffic flow.

2. Community Facilities

Creation and development of needed community facilities such as schools, playgrounds, parks, churches, libraries, health and medical centers, hospitals and governmental service centers and facilities all carefully located for convenience of access, of adequate size to serve the population and with special attention to the avoidance of conflicting functional activities in living, working and business areas.

3. Service Facilities

Provision for facilities such as water, power, gas drainage and sewage disposal in a manner which will effectively satisfy the needs of all areas of the city and which will be designed on the basis of the controlling physical, topographical and climatic conditions as well as on the planned uses and occupancy densities which may be expected.

4. Circulation System and Terminal Facilities

Improvement and development of an adequate street, highway and transportation system which connects all related parts of the city, carries through traffic away from congested centers, avoids encroachment on living and working areas, includes necessary terminal auto parking, freight and passenger depot facilities, provides for different types of travel and traffic and, especially in the busiest areas, provides for adequate separation of the several types of traffic such as trucking, mass transit, private auto and pedestrian, and in all cases is designed with maximum regard for combined convenience, rapid flow and safety.

5. Local Resources

Conservation, protection and improvement of all possible resources whether natural, man-made, scenic, esthetic, historical, cultural or any other usual or unusual condition which may contribute to the economic, recreational, cultural or social life and well being of the community by controlling floods, erosion and smog and such other action as may be necessary to insure that careless neglect or unwise action will not result in the loss of resources which may be irreplaceable.

Analysis of Present Land Use in the City

A classification of existing land uses by the Los Angeles Department of Water and Power is the only available source of general data covering the entire city. The latest information is for 1954. Since the proposed plans are of a generalized nature, only generalized classifications are considered in this analysis.

The following tabulation indicates the changes in land use from 1924 to 1954 and compares the actual land uses in 1954 with the zoning in 1957:

Type of Use	% of City Area				
	1924	1934	1944	1954	Zones 1958
Vacant	81.70	48.55	43.23	36.72	---
Agricultural		24.55	21.83	8.75	25.503
Residential	15.70	24.19	29.81	48.78	59.120
Commercial	1.45	1.80	2.73	3.25	5.541
Industrial	1.15	.90	2.40	2.50	9.836
	100.00	100.00	100.00	100.00	100.000

As might be expected the outstanding changes were:

Vacant area has gradually decreased.

Agricultural area has likewise decreased and at an accelerated rate since 1944.

Residential area increased and at a faster rate after 1944.
Commercial area increased very slowly.
Industrial area increased very slowly.

The more startling fact is that the commercial and industrial area increases fall far behind the rise in residential acreage.

It is obvious that much more land is zoned for industry and commerce than has been utilized as such. Wrong location may account for some of this. It is also recognized that the occupancy of these zones by residential uses makes them difficult and expensive to acquire and develop for the zoned use. Recent studies of existing land use in blighted areas have demonstrated the existence of the latter situation and this is expected to be a basis for certain redevelopment projects.

Suggested Changes in Use

The preliminary studies for proposed long-range land use are based on the desirability for establishing a reasonable balance between the different uses as set forth in the above statement of objectives. These are the guiding principles used in the restudy of the San Fernando Valley and should be extended to the remainder of the city.

One of the major planning problems is the low ratio of industrial uses to other uses and its effect on the economy and tax base. This is a matter of some concern when it is noted that the 2.50% industrial use area in Los Angeles is so far below that in some other cities, such as the 21% in St. Louis, Missouri. For this reason an effort was made in this study to increase the future area which may be used for industry. By converting certain blighted residential areas presently occupying industrial zones, the Urban Renewal Program can be an effective tool in reaching a part of this objective. The plan suggests an increase in total industrial area to about 10%.

Need for More Research and Detailed Study of Land Use

These preliminary plans are merely the beginning of an extensive program of research and planning study needed to arrive at reasonably sound long-range plans for land use. The first step would be an up-to-date detailed inventory of existing land uses. Some of this inventory is in progress by the Urban Renewal Section as part of neighborhood analysis of blighted areas. It should be expanded to cover the entire city and kept constantly current as a basis for the use of the entire staff in considering all daily problems of planning and zoning.

Continuous research and study into the problems of economic base, land economy, population distribution and trends, transportation and circulation, educational, recreational and cultural needs, physical land use and development, conservation and other factors of City growth are all a part of the required process for preparing, maintaining and effectuating a complete and effective master plan for the city.

JOSEPH HOROWITZ,¹ J. M. ASCE.—A stimulating survey of current urban planning concepts and problems has been presented by Mr. Grimm. Of

1. Field Engr., Andrews and Clark, Cons. Engrs., New York, N. Y.

particular interest is the discussion of land-use classifications, as employed in both urban planning and zoning.

Land classification based upon environmental effects, as recommended by Mr. Grimm, provides the planner with a more meaningful tool than the old groupings based on purpose, such as "residential", "industrial", etc. However, the next logical step—the application of this concept to zoning regulations—should be approached with caution.

A system of classification used in planning studies is at all times subject to the control of the planner. He can modify and adjust, or abandon it entirely, if he desires, in response to changing requirements. Once incorporated into the zoning regulations, on the other hand, this freedom in applying the system is replaced by the need for a consistent and impartial application which can command the respect of the public and the support of the courts.

Zoning regulations based on the "purpose of use" do result in inconsistencies such as those cited by Mr. Grimm, but have the advantage—from the practical administrative viewpoint—of being more easily grasped and readily applied. In any zoning system, there is always pressure on the administering agency to permit exceptions to the rules. The greater flexibility of a classification based on environmental effects, while permitting more realistic and consistent zoning, increases this tendency to seek exceptions, and encourages unscrupulous persons to seek loopholes in the law that will defeat its purpose.

The extent to which a particular industry, commercial or public establishment is a source of nuisance depends not only on its purpose and design, but to a large extent on the manner in which it is operated. This makes it difficult to determine beforehand whether or not a particular business not yet in operation will meet the standards. The actions of a planning board in approving one establishment and disapproving another whose function is identical may seem arbitrary and unreasonable when based on differences in process or plant layout which are (to the layman) minor and superficial. For example, it would be hard to convince the public and the courts that one gasoline station or hospital in a certain neighborhood is desirable, but another, not yet in existence, would be a nuisance.

It is also true that in a rapidly changing technology an enterprise may, through changes in its manufacturing process, labor force or marketing methods, become definitely objectionable in an area in which it was formerly accepted. Ordinances dealing with smoke, noise, pollution, etc., can limit the effects of such degeneration, but they cannot entirely prevent it.

Recognizing these factors, the existing regulations sacrifice a more ideal type of classification in the interests of simplicity and ease of enforcement.

These remarks are not intended to discourage the introduction of zoning regulations based on more flexible and meaningful standards. Rather, they are intended to emphasize that when revisions are made, careful attention should be paid to the legal and administrative problems of enforcement. Like any law, zoning regulations are effective only to the degree that they are applied and enforced.

SERGEI N. GRIMM,¹ A. M. ASCE.—The several written discussions of the paper on "Some Aspects of Urban Planning" substantially contributed to its subject. Many other valuable comments came from those who were not in a

1. Planning Cons., Syracuse, N. Y.

position to express their thoughts in written form. These concluding remarks aim to reflect all of them.

Mr. Cherniack's succinct comments bring into focus some of the principal points of the original paper. Mr. Cherniack also makes a proposal of far reaching significance which merits a discussion of its own, and which brings into focus another point of the original paper not directly mentioned by him. It is "stage planning".

Mr. Cherniack's proposal relates to such an effective comprehensive planning of certain obsolete portions of urban areas that it would make it possible to modernize them on a sound economic basis without resorting to subsidy. It is this kind of planning that leads to action, making planning a dynamic phase of urban development. The planning operation proposed by Mr. Cherniack is the second, definitive stage of urban planning which is not mentioned in the discussion of Mr. Claire. The outline of planning operations as offered by Mr. Claire is an excellent example of the "orthodox" city planning that has proved to be ineffective and cumbersome because of attempting to do in one operation what has to be done in at least two stages.

In stage planning, described in the original paper, the first "general planning" stage is less detailed than in the single-stage orthodox city planning, while the second planning stage of comprehensive portions of urban area extend further than in the orthodox planning, includes practical ways and means consideration, and is carried on to the point of decisions and action (beginning with the preparation of construction plans, or in corresponding form in case of other development actions). It is this second stage of planning that makes it a dynamic phase of urban development. Since many improvements (such as highways, urban renewal and housing) are planned and carried out as limited "projects" rather than planned and developed on a comprehensive area basis, comprehensive planning is stopped short of its logical extent, making it necessary to do in a single stage planning operation more than is practical.

Under the stage planning arrangement, it is very easy to carry on the planning on a continuous basis and to maintain full flexibility in the "general planning" stage. No approvals entailing amendment proceedings restraining the freedom of changes are needed. "Acceptance" and making it a part of the official record, is sufficient.

At the same time the plans in the second definitive stage are subject to formal approvals and made sufficiently firm to avoid the delays and confusion of last minute changes.

Mr. Horowitz properly counsels caution in applying to zoning a classification of land use based upon the environmental effects, pointing out several problems. While there is a solution to the problems mentioned by Mr. Horowitz, there are other problems which are yet to be dealt with. This has to be done promptly. Zoning regulations, as they are usually drawn and applied, are now headed for collapse under the weight of inconsistencies mounting into general unreasonableness. Besides, they may cause such difficulty in guiding urban land developments precipitated by the national urban programs as to create a crisis.

The legality of new arrangements should be carefully studied before they are proposed. The new branch of engineering—environmental engineering—should contribute to the analysis of environmental effects of land use. With its aid, the general ideas of mental health specialists concerning the relation between mental health and environment should be brought into play.

The role of "private planning" of land use, which is largely within the domain of private decision, needs to be expanded. This will have a profound effect upon the nature and extent of regulatory devices.

There should not be difficulty in helping the public to grasp the idea of levels of environment if it is clearly presented, provided planners stop stimulating fear of incompatible uses among the people. They should make possible orderly consideration and use of effective devices of "harmonizing zoning", i.e., (old transitional zoning augmented by devices developed in drafting "conditions" under "conditional use" clause proceedings, etc.).

It would take another paper to describe how the use of "harmonizing zoning" can lead toward continuous reduction of the volume of special proceedings and thus reverse the trend in the ever increasing number of cases handled by planning boards and boards of zoning appeals.

It will suffice to say that the vast volume of decisions of the boards and of zoning administrators provides a gold mine of material for formulation of general regulations if these decisions are viewed as an expression of common sense in dealing with the hardships caused not by the unique situation of a property but by inadequacy of regulations.

Mr. Claire denies the validity of "working hypothesis" without offering other explanation of how a plan is evolved, which is certainly not a mechanical process, but a creative one. Even in the planning of a single large improvement, such as a highway, drainage or water supply system, etc., the operations proceed from reconnaissance to definitive planning. Potential solutions are sought through reconnaissance, to be verified or rejected by more extensive surveys and analysis. Planning for the physical development of an urban community involving simultaneous consideration of a multitude of improvements is not different. It is more difficult, but still a creative and analytical process. However, since the nature of planning process is questioned, it would be well to look into the matter further. Perhaps the shortage of planners could be solved by substituting a "univac" for imaginative analysts and designers that planners are supposed to be.

Several significant things emerged from the written and other discussions of the original paper. One of them is the need for realization of the limitations of planning as a device of dealing with the unknown future.

Limitation due to rapid changes is recognized. In "stage planning" it is fully taken into account by making the first stage—general planning—completely flexible and continuous.

Another limitation is yet to be given full consideration. It stems from the fact that people "flow" in and out of a community and move within an urban area so much so that the people who live or work in some place are not the same people who may be there tomorrow. Their characteristics, mode of living and their motivations and decisions may be different. This limits the accuracy of the use of survey and research as well as the dependability of decisions. Greater reliance upon flexibility in actual design of improvements is needed through liberal provision of capacities of the improvements, wider rights-of-ways, etc. What is even more important is that greater emphasis should be placed upon the current adjustment of public facilities and improvements to reflect the changes in land use, etc. Such conditions, as traffic congestion, which are usually explained by the lack of long-range planning, would not occur if land development contributing to such congestion were continuously taken into account and reflected in prompt adjustments of public improvements.

Constitutional limitation of urban planning was emphasized by J. Cal Callahan at a recent meeting of the City Planning Division of the A.S.C.E. Full development of physical resources is a desirable objective which is to be achieved through the play of social and economic forces with the guides and controls justified by the consideration of public health, safety and welfare. A pattern of land use deemed by a planner, in the light of limited current intelligence, to be affording "the maximum convenience, comfort, safety and enjoyment" cannot be an objective.

Efficiency and economy are not primary objectives. Some waste is the price for liberty and progress.

There are numerous evidences of getting away from the concept of "pattern". The increasing use of performance standards in guiding the development of land through building, zoning and other regulations is an evidence of efforts in the same direction. Yet some planners and schools of planning continue to practice and preach along the orthodox lines.

A multitude of business leaders abhoring government interference in their personal affairs, once named on planning and zoning boards proceed to fix the pattern of land use in their communities and to determine what is the best location for other business people to succeed in their enterprise. Civic leaders devote their efforts to the preparation of a master plan without really knowing what it is and without realizing that there just cannot be a "long-range comprehensive, fully coordinated master plan", prepared and approved in a single sweeping operation.

What is obviously needed is prompt action defining modern urban planning to do away with the confusion that impedes the progress of urban development programs, and to get away from tendencies that are inimical to the American way of life.

PROCEEDINGS PAPERS

The technical papers published in the past year are identified by number below. Technical-division sponsorship is indicated by an abbreviation at the end of each Paper Number, the symbols referring to: Air Transport (AT), City Planning (CP), Construction (CO), Engineering Mechanics (EM), Highway (HW), Hydraulics (HY), Irrigation and Drainage (IR), Pipeline (PL), Power (PO), Sanitary Engineering (SA), Soil Mechanics and Foundations (SM), Structural (ST), Surveying and Mapping (SU), and Waterways and Harbors (WW), divisions. Papers sponsored by the Department of Conditions of Practice are identified by the symbols (PP). For titles and order coupons, refer to the appropriate issue of "Civil Engineering." Beginning with Volume 82 (January 1956) papers were published in Journals of the various Technical Divisions. To locate papers in the Journals, the symbols after the paper number are followed by a numeral designating the issue of a particular Journal in which the paper appeared. For example, Paper 1459 is identified as 1459 (HY 7) which indicates that the paper is contained in the seventh issue of the Journal of the Hydraulics Division during 1956.

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DECEMBER: 1449(HY6), 1450(HY6), 1451(HY6), 1452(HY6), 1453(HY6), 1454(HY6), 1455(HY6), 1456(HY6)^c, 1457(PO6), 1458(PO6), 1459(PO6), 1460(PO6)^c, 1461(SA6), 1462(SA6), 1463(SA6), 1464(SA6), 1465(SA6), 1466(SA6)^c, 1467(AT2), 1468(AT2), 1469(AT2), 1470(AT2), 1471(AT2), 1472(AT2), 1473(AT2), 1474(AT2), 1475(AT2), 1476(AT2), 1477(AT2), 1478(AT2), 1479(AT2), 1480(AT2), 1481(AT2), 1482(AT2), 1483(AT2), 1484(AT2), 1485(AT2)^c, 1486(BD2), 1487(BD2), 1488(PO6), 1489(PO6), 1490(BD2), 1491(BD2), 1492(HY6), 1493(BD2).

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JANUARY: 1494(EM1), 1495(EM1), 1496(EM1), 1497(IR1), 1498(IR1), 1499(IR1), 1500(IR1), 1501(IR1), 1502(IR1), 1503(IR1), 1504(IR1), 1505(IR1), 1506(IR1), 1507(IR1), 1508(ST1), 1509(ST1), 1510(ST1), 1511(ST1), 1512(ST1), 1513(WW1), 1514(WW1), 1515(WW1), 1516(WW1), 1517(WW1), 1518(WW1), 1519(ST1), 1520(EM1), 1521(IR1)^c, 1522(ST1)^c, 1523(WW1)^c, 1524(HW1), 1525(HW1), 1526(HW1)^c, 1527(HW1).

FEBRUARY: 1528(HY1), 1529(PO1), 1530(HY1), 1531(HY1), 1532(HY1), 1533(SA1), 1534(SA1), 1535(SM1), 1536(SM1), 1537(SM1), 1538(PO1)^c, 1539(SA1), 1540(SA1), 1541(SA1), 1542(SA1), 1543(SA1), 1544(SM1), 1545(SM1), 1546(SM1), 1547(SM1), 1548(SM1), 1549(SM1), 1550(SM1), 1551(SM1), 1552(SM1), 1553(PO1), 1554(PO1), 1555(PO1), 1556(PO1), 1557(SA1)^c, 1558(HY1)^c, 1559(SM1)^c.

MARCH: 1560(ST2), 1561(ST2), 1562(ST2), 1563(ST2), 1564(ST2), 1565(ST2), 1566(ST2), 1567(ST2), 1568(WW2), 1569(WW2), 1570(WW2), 1571(WW2), 1572(WW2), 1573(WW2), 1574(PL1), 1575(PL1), 1576(ST2)^c, 1577(PL1), 1578(PL1)^c, 1579(WW2)^c.

APRIL: 1580(EM2), 1581(EM2), 1582(HY2), 1583(HY2), 1584(HY2), 1585(HY2), 1586(HY2), 1587(HY2), 1588(HY2), 1589(IR2), 1590(IR2), 1591(IR2), 1592(SA2), 1593(SU1), 1594(SU1), 1595(SU1), 1596(EM2), 1597(PO2), 1598(PO2), 1599(PO2), 1601(PO2), 1602(PO2), 1603(HY2), 1604(EM2), 1605(SU1)^c, 1606(SA2), 1607(SA2), 1608(SA2), 1609(SA2), 1610(SA2), 1611(SA2), 1612(SA2), 1613(SA2), 1614(SA2)^c, 1615(IR2)^c, 1616(HY2)^c, 1617(SU1), 1618(PO2)^c, 1620(CP1).

MAY: 1621(HW2), 1622(HW2), 1623(HW2), 1624(HW2), 1625(HW2), 1626(HW2), 1627(HW2), 1628(HW2), 1629(ST3), 1630(ST3), 1631(ST3), 1632(ST3), 1633(ST3), 1634(ST3), 1635(ST3), 1636(ST3), 1637(ST3), 1638(ST3), 1639(WW3), 1640(WW3), 1641(WW3), 1642(WW3), 1643(WW3), 1644(WW3), 1645(SM2), 1646(SM2), 1647(SM2), 1648(SM2), 1649(SM2), 1650(SM2), 1651(HW2), 1652(HW2)^c, 1653(WW3)^c, 1654(SM2), 1655(SM2), 1656(ST3)^c, 1657(SM2)^c.

JUNE: 1658(AT1), 1659(AT1), 1660(HY3), 1661(HY3), 1662(HY3), 1663(HY3), 1664(HY3), 1665(SA3), 1666(PL2), 1667(PL2), 1668(PL2), 1669(AT1), 1670(PO3), 1671(PO3), 1672(PO3), 1673(PL2), 1674(PL2), 1675(PO3), 1676(PO3), 1677(SA3), 1678(SA3), 1679(SA3), 1680(SA3), 1681(SA3), 1682(SA3), 1683(PO3), 1684(HY3)^c, 1685(SA3), 1686(SA3), 1687(PO3), 1688(SA3)^c, 1689(PO3)^c, 1690(HY3)^c, 1691(PL2)^c.

JULY: 1692(EM3), 1693(EM3), 1694(ST4), 1695(ST4), 1696(ST4), 1697(SU2), 1698(SU2), 1699(SU2), 1700(SU2), 1701(SA4), 1702(SA4), 1703(SA4), 1704(SA4), 1705(SA4), 1706(EM3), 1707(ST4), 1708(ST4), 1709(ST4), 1710(ST4), 1711(ST4), 1712(ST4), 1713(SU2), 1714(SA4), 1715(SA4), 1716(SU2), 1717(SA4), 1718(EM3), 1719(EM3), 1720(SU2), 1721(ST4)^c, 1722(ST4), 1723(ST4), 1724(EM3)^c.

AUGUST: 1725(HY4), 1726(HY4), 1727(SM3), 1728(SM3), 1729(SM3), 1730(SM3), 1731(SM3), 1732(SM3), 1733(PO4), 1734(PO4), 1735(PO4), 1736(PO4), 1737(PO4), 1738(PO4), 1739(PO4), 1740(PO4), 1741(PO4), 1742(PO4), 1743(PO4), 1744(PO4), 1745(PO4), 1746(PO4), 1747(PO4), 1748(PO4), 1749(PO4).

SEPTEMBER: 1750(IR3), 1751(IR3), 1752(IR3), 1753(IR3), 1754(IR3), 1755(ST5), 1756(ST5), 1757(ST5), 1758(ST5), 1759(ST5), 1760(ST5), 1761(ST5), 1762(ST5), 1763(ST5), 1764(ST5), 1765(WW4), 1766(WW4), 1767(WW4), 1768(WW4), 1769(WW4), 1770(WW4), 1771(WW4), 1772(WW4), 1773(WW4), 1774(IR3), 1775(IR3), 1776(SA5), 1777(SA5), 1778(SA5), 1779(SA5), 1780(SA5), 1781(WW4), 1782(SA5), 1783(SA5), 1784(IR3)^c, 1785(WW4)^c, 1786(SA5)^c, 1787(ST5)^c, 1788(IR3), 1789(WW4).

OCTOBER: 1790(EM4), 1791(EM4), 1792(EM4), 1793(EM4), 1794(EM4), 1795(HW3), 1796(HW3), 1797(HW3), 1798(HW3), 1799(HW3), 1800(HW3), 1801(HW3), 1802(HW3), 1803(HW3), 1804(HW3), 1805(HW3), 1806(HY5), 1807(HY5), 1808(HY5), 1809(HY5), 1810(HY5), 1811(HY5), 1812(SM4), 1813(SM4), 1814(ST5), 1815(ST5), 1816(ST5), 1817(ST5), 1818(ST5), 1819(ST5), 1820(ST5), 1821(ST5), 1822(EM4), 1823(PO5), 1824(SM4), 1825(SM4), 1826(SM4), 1827(ST5)^c, 1828(SM4)^c, 1829(HW3)^c, 1830(PO5)^c, 1831(EM4)^c, 1832(HY5)^c.

NOVEMBER: 1833(HY6), 1834(HY6), 1835(SA6), 1836(ST7), 1837(ST7), 1838(ST7), 1839(ST7), 1840(ST7), 1841(ST7), 1842(SU3), 1843(SU3), 1844(SU3), 1845(SU3), 1846(SU3), 1847(SA6), 1848(SA6), 1849(SA6), 1850(SA6), 1851(SA6), 1852(SA6), 1853(SA6), 1854(ST7)^c, 1855(SA6)^c, 1856(HY6)^c, 1857(ST7)^c, 1858(SU3)^c.

DECEMBER: 1859(HY7), 1860(IR4), 1861(IR4), 1862(IR4), 1863(SM5), 1864(SM5), 1865(ST8), 1866(ST8), 1867(ST8), 1868(PP1), 1869(PP1), 1870(PP1), 1871(PP1), 1872(PP1), 1873(WW5), 1874(WW5), 1875(WW5), 1876(WW5), 1877(CP2), 1878(ST8), 1879(ST8), 1880(HY7)^c, 1881(SM5)^c, 1882(ST8)^c, 1883(PP1)^c, 1884(WW5)^c, 1885(CP2)^c, 1886(PO6), 1887(PO6), 1888(PO6), 1889(PO6), 1890(HY7), 1891(PP1).

c. Discussion of several papers, grouped by divisions.

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